# PROJECT FACT SHEET

**CONTRACT TITLE:** Economic Recovery of Oil Trapped at Fan Margins Using High Angle Wells and Multiple Hydraulic Fractures -- Class III

**ID NUMBER:** DE-FC22-95BC14940

**B&R CODE:** AC1010000

**CONTRACTOR:** AERA Energy LLC

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**DOE PROJECT MANAGER:**

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**PROJECT SITE**
**CITY:** Bakersfield **STATE:** CA
**CITY:** Yowlumne Field, Kern County **STATE:** CA
**CITY:** **STATE:** CA

**CONTRACT PERFORMANCE PERIOD:**
9/29/1995 to 9/28/2001

**PROGRAM:** Reservoir Life Extension
**RESEARCH AREA:** Seismic/Class 3
**PRODUCT LINE:** DCS

**CO-PARTICIPANTS:**

| | | | |
|---|---|---|---|
| **PERFORMER:** | **CITY:** | **STATE:** | **CD:** |
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| **PERFORMER:** | **CITY:** | **STATE:** | **CD:** |

| FUNDING (1000'S) | DOE | CONTRACTOR | TOTAL |
|---|---|---|---|
| PRIOR FISCAL YRS | 3926 | 3926 | 7852 |
| FY 2002 CURRENT OBLIGATIONS | 0 | 0 | 0 |
| FUTURE FUNDS | 0 | 0 | 0 |
| TOTAL EST'D FUNDS | 3926 | 3926 | 7852 |

**OBJECTIVE:** Apply several advanced technologies, such as high angle wells and hydraulic fracturing , to economically develop potential reserves of bypassed oil trapped within thinly bedded, heterogeneous fan margin portions of a slope-basin clastic reservoir.



March 2002

**PROJECT DESCRIPTION:**

**Background**: In more than 20 years, the Yowlumne Field has experienced primary depletion, a secondary recovery program, and significant decline as the waterflood programs mature. The present project seeks to economically develop potential reserves and under-recovered portions of the waterflooded submarine Yowlumne Field reservoir by coupling several advanced technologies. Using demonstrated cost effective technology the project is expected to produce about 750,000 bbls of incremental oil effectively improving recovery by 25% to 45%. The project will attempt to demonstrate the use of hydraulically fractured horizontal or high angle wells to expose greater extent of pay zone while maintaining vertical communication between thin inter-bedded layers and the well bore. Through transferring project findings from applied technology to operators of similar reservoirs, an additional 80 million bbls of new oil production is anticipated.

**Work to be Performed**: A high-angle well will be drilled in the fan margin and will be completed with multiple hydraulic-fracture treatments. Connectivity of thin reservoir layers will be established along the well path by the fracture planes. Geologic modeling, reservoir characterization, and fine-grid reservoir simulation will be used to select the location and orientation of the well. Design parameters for the hydraulic-fracture treatments will be determined by hydraulically fracturing an existing well. Fracture azimuths will be predicted in part by the microseismic logging of an offset well during the hydraulic-fracture treatment of the existing well.

**PROJECT STATUS:**

**Current Work**: The project was initiated and run by ARCO. The property was transferred to AERA Energy at the end on 1998. Project is in close out, Budget Period II.

**Scheduled Milestones:**

| | |
|---|---|
| Data analysis and post-well modeling | 03/98 |
| Reservoir modeling | 03/98 |
| Reservoir management | 09/01 |
| Technology Transfer | 09/01 |

**Accomplishments:** A fine-grid partial-field reservoir simulation model of the northeast fan-margin region was built and used to test a variety of development alternatives. Model forecasts compared slant well performance to more conventional development options and quantified rate impacts due to changes in well location, orientation, and completion technique. The model was used to site the location and orientation of the slant well. The slant well was drilled to a total depth of 14,300 ft with a 1,100 ft lateral across the thin bedded fracture zone. After logging, production liners were run and cemented across the target formation. However, well conditions prevented the 7 inch liner from reaching bottom. The final 1000 ft were cased with a 5 inch liner. Much of the target formation, primarily behind the 5 inch liner, proved to be swept by waterflood operations. Consequently, the three hydraulic fracture treatments originally planned for the well were reduced to one. In addition, cement bond logs revealed a poor bond between the 5 inch liner and formation leaving only one viable hydraulic fracture treatment candidate. After pumping a remedial cement squeeze, the well was perforated and stimulated with a non-acid reactive KCl fluid. The well is producing at a rate of 250 BOPD, 190 MCFPD, and 120 BWPD. The well was completed (fractured) in sand intervals A,B, and C. Sands D&E were not completed as they contain a high water saturation, which would flow vertically if they had been fractured. Recommendation for drilling another well in the area include less of an inclination in the drilling curve to reduce frac gradient, more powerful mud-motors and a stronger bit because the abrasive nature of the turbidite sediments. The stimulation process was under additional evaluation. Pay intervals were perforated during 4th quarter 1998 and treated with KCI water. A half day workshop in August 1998 addressed the reservoir characterization, and engineering problems encountered in drilling and completing the horizontal well and fracture treatments.

**TECHNOLOGY TRANSFER:**

**Technology/Information Transfer:**

**Public Relations:**

Updated By: Date: